RST425

Short Burst Data Modem

Installation & User Manual

Beam Communications Pty Ltd

RST425
Installation and
User Manual

Beam Communications Pty Ltd

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CONVENTIONS IN THIS MANUAL

Warnings, cautions and notes appear throughout this manual.

They are represented by following conventions.

Warning: This symbol and associated text indicate a warning note providing information to prevent personal injury or damage to equipment.

Note: This symbol and associated text indicate a note providing general operating information.

Interference: All wireless phones may get interference, which could affect performance.

Safety Information

Note: Read the following information before installing and using the BEAM RST425.

Your RST425 is a low power radio transmitter and receiver. When it is ON, it receives and sends out radio frequency (RF) signals.

The design of your RST425 system complies with international safety standards.

Refer to the appropriate section of the *RST425 User Manual* for additional relevant safety information.

Warning:
Do not open equipment. There are no user-serviceable parts inside.
If a DC power supply is to be used, its output must comply with the Safety Extra Low Voltage (SELV) requirements of IEC60950.

All connectors except the Line and Accessory sockets must only be connected to equipment ports which comply with the Safety Extra Low Voltage (SELV) requirements of IEC60950."

About BEAM Communications

Beam Communications, is an authorised manufacturer of Iridium Satellite products.

Beam develops subscriber products that utilise the Iridium satellite network of Low Earth Orbit satellites, known as LEOs. The Iridium network is extensively used around the world by commercial enterprises and defence agencies.

Beam products address the needs of individuals, communities, government agencies and the corporate sector, providing voice and data access without the need for traditional wire-line or mobile phone infrastructure.

As the Iridium satellite network is global, Beam's products address global markets, across the spectrum of rural and remote users, including households, motor vehicles, telemetry, maritime and emergency services.

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What is the RST425?

The RST425 is a Remote Satellite Short Burst Data only modem designed to provide a reliable and cost effective means of Iridium SBD development.

It utilizes the Iridium SBD (Short Burst Data) module and provides a female D9 RS232 connector, for direct connection to a PC.

Key Features:

- Small form Factor
- No SIM Card Required
- Maximum mobile originated message size of 340 bytes
- Maximum mobile terminated message size of 270 bytes
- Visual indication of network availability

Package Contents

The RST425 package contains:

- 1 x RST425 Short Burst Data Modem
- 1 x DC External Cable *[CBLASY001602]*
- 1 x TNC-F to SMA-M coaxial adaptor *[TNCF-SMAM]*
- 1 x Serial Data Cable DB9M to DB9F *[CBLASY005501]*
- 1 x Resources CD (includes User Manual) *[CDROM0001xx]*

Optional Beam Accessories

RST910	Fixed Mast Antenna
RST915	Magnetic Mount Antenna
RST920	Bolt Mount Antenna
RST985	Serial to USB Converter Cable

See your Service Provider for pricing and availability of these optional accessories

Installing the RST425

Connecting the Antenna Cable

1. Screw the TNC-F to SMA-M coaxial adaptor onto the antenna jack located on the back end of the module.

2. Ensure that the cable being used is long enough to reach from the RST425 to the Antenna location. Plug the antenna cable into the adapter.

3. Ensure that you fasten the antenna cable securely to the TNC jack by screwing the cable firmly all the way in with your fingers.

4. Please refer to the Antenna Installation Guide for important information on installation and placement of your antenna.

Note: Refer to the Antenna Installation Guide supplied with your RST425 for information on installing the antenna and assuring Quality of Service.

This guide is also available for download at www.beamcommunications.com

Connecting the Power Cable and Serial Cables

The module is powered from a 9 to 32V DC supply using a 2-pin circular-ring connector from the supplied cable. Attach the 4mm eyelets to a compliant power supply. **The positive terminal is identified by a RED sleeve over eyelet**.

The front **LED** has a dual function:

> **Green** – Power OK and network visible.
>
> **Orange** – Power OK but network unavailable.

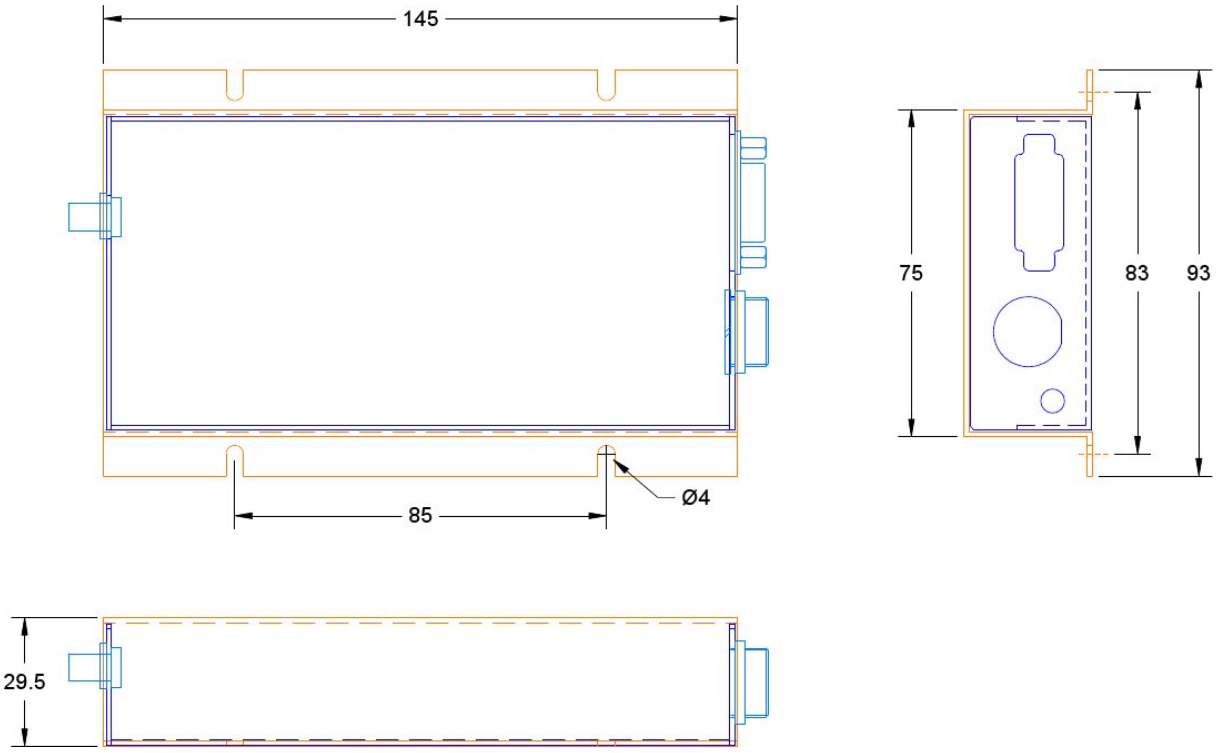
The **9-pin D-Connector** provides the Communications Serial port to the RST425 terminal. This connects directly to a Computer or communicating terminal device.

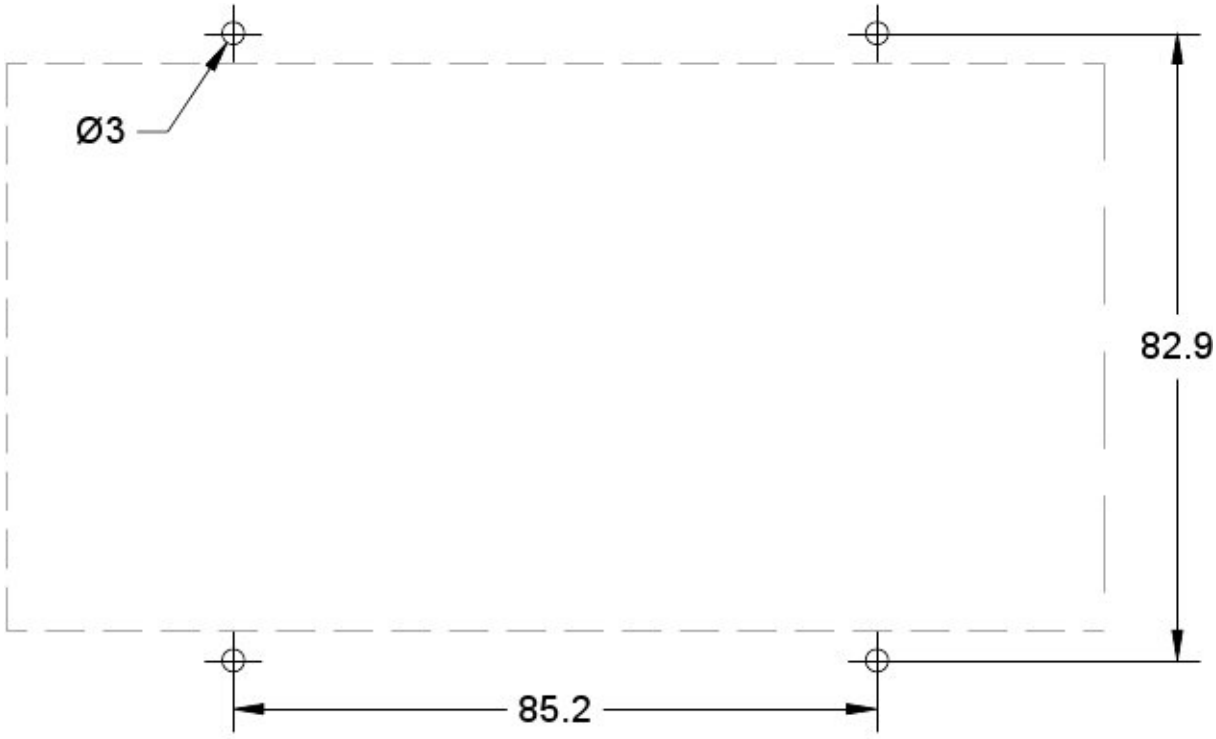
The default baud rate is 19200 8N1. The RST425 does not have an autobaud facility. The baud rate can be set via the AT+IPR=*n* where *n* is one of the following.

N	BAUD
1	600
2	1200
3	2400
4	4800
5	9600
6	19200 (default)
7	38400
8	57600
9	115200

[Refer to the ISU AT Command Reference for other available AT commands].

Dimensions and Mounting





Mounting Pattern

Specification Summary

RST425

Electrical	
Power	9 – 32 VDC, 2A
Plug-pack (if provided)	90-250VAC 50/60Hz input
Power Consumption (Average)	
Standby Mode	0.4W
Transmit Mode Peak	1.8W
Modem Type	SBD Data only
Speed	2400 bps
EMC Compliance	CE
Environmental	
Operating Temperature Range	-35°C to +70°C ambient
Operating Humidity Range	<85% RH non-condensing
Storage temperature	-40C to +85C
Weight	0.5 kg
Dimensions	160 x 93 x 30mm
RF Interface (SBD Transceiver)	
Frequency range	1616MHz to 1626.5MHz
Peak Power	9W (max)
Average Power	1.75 W (During message transfer)
Standby Power	0.33W
Receiver Sensitivity	-118.5 dBm at 50W (typical)
Receiver Spurious Rejection at offsets > 1 MHz (typical)	60 dB
Multiplexing method	TDMA / FDMA
Oscillator stability	±1.5ppm
Input/output impedance	50 Ohms – TNC F Connector

RS232 Specification

The RST425 is provided with an RS232 serial port for data connection. The 9-pin D-type (female) sockets, wired DCE for connection to a standard PC with a 1:1 cable.

Physical Connection

The pin-out of both connectors is described in the following table:

Pin	Signal	Direction	Description
1	DCD	RST → PC	Data Carrier Detect (Driven ON at all times)
2	RXD	RST → PC	Received Data
3	TXD	PC → RST	Transmitted Data
4	DTR	PC → RST	Date Terminal Ready
5	GND		Signal Ground (Common)
6	DSR	RST → PC	Data Set Ready (CTS and DCD)
7	RTS	PC → RST	Request to Send
8	CTS	PC → RST	Clear to Send
9	RI	RST → PC	Ring Indicate

RS232 Port Signal Support and Handshaking

The Serial data interface is used to both command the RST425 and transfer user data to and from the Transceiver. The RST425 presents a 9-wire data port to the FA (Field Application), where the interface is at RS232 levels. With respect to this interface, the RST425 behaves as a DCE (Data Communication Equipment), and the FA behaves as a DTE (Data Terminal Equipment).
The terms “FA”and “DTE” are used interchangeably throughout this document; similarly for the term “DCE”.
Autobaud is not supported in RST425 SBD Transceiver. The baud rate can be set via the AT+IPR command. The default rate is 19200 bps.

9-Wire and 3-Wire Operation

By default, the serial interface operates as a 9-wire connection. Table 9 describes each of the signals, where “input” means an input to the RST425, and “output” means an output from the RST425 SBD Transceiver.

RXD - Active high data output [The DTE receives the data from the RST425].
TXD - Active high data input [Data is transmitted from the DTE to the RST425].
GND - 0V.
RTS - Active low flow control input.
CTS - Active low flow control output RTS and CTS are used together to implement hardware flow control when enabled with AT&K3.
DTR - Active low handshaking input AT&Dn controls how the RST425 uses DTR:
If set to AT&D0, DTR is always ignored. Otherwise DTR set to OFF places the data port into UART test mode after 10 seconds, or immediately on boot-up. A subsequent transition of DTR to ON returns the data port to DCE mode and resets it to its power-on state.
The UART test mode is provided for factory testing of the data port UART. An FA should never activate test mode; if it does, the RST425 will stop responding to AT

commands until the data port is returned to DCE mode.
DSR - Active low handshaking output.
The RST425 drives DSR ON when the data port is in DCE mode, and OFF when the data port is in test mode. The DTE may use this signal as an indication that the RST425 is powered up and ready to receive AT commands.
RI - Active low ring indicator output.
The RST425 drives RI ON when it receives a Automatic Notification from the network that a Mobile Terminated SBD Message is queued at the Gateway, and drives RI OFF after 5 seconds or when the DTE initiates an SBD session, whichever occurs first.
DCD - Active low handshaking output.
DCD is driven OFF at all times.

Note: the Ring Indicator (RI) pin is used by the RST425 SBD Transceiver to indicate that a Mobile Terminated SBD (MT-SBD) message is queued at the Gateway. The Field Application can monitor this pin and use appropriate AT Commands to command the Transceiver to retrieve the MT-SBD message.

The serial interface may be operated with a **3-wire connection**, where only transmit, receive and ground signals are used. However the 9 wire interface offers better control and is the recommended implementation. Iridium is only able to provide limited 3-wire interface support. When operating with a 3wire connection, the following rules apply:

- AT&Dn must be set to AT&D0 to ignore the DTR input
- AT&Kn must be set to AT&K0 to disable RTS/CTS flow control
- The other output signals may be connected, and operate as follows:
  - CTS driven ON (low)
  - DSR operates as normal
  - RI operates as normal
  - DCD driven ON (low)

Note: RTS/CTS flow control, when enabled, is only used when the data port is in SBD data mode. In AT command mode, RTS is ignored and CTS is driven ON (low).

RS232 Port Electrical Parameters

The LBT Data Port conforms to the RS232 interface specification with the following parameters:

Parameter	Specification
Communication Rate	220 to 115,200 Baud[1]
Protocol	1 start bit, 8 data bits, no parity, 1 stop bit, asynchronous.
Voltage Levels and Sensitivity	RS232 compliant

[1] Autobaud is not supported in RST425 SBD Transceiver. The baud rate can be set via the AT+IPR command. The default rate is 19200 bps

Data Connectivity

To connect your RST425 to a PC or laptop, simply connect the 9-pin serial plug from your RST425 interface cable to a 9-pin (Male) port on your PC or laptop.

If you do not have a serial port on your PC / laptop, an *RST985 Serial to USB Converter Cable* is available from your supplier.

Please refer to the following documents (on CDROM) for correct operation of Short Burst Data functionality:

"Beam SBD Developer Guide"

"ISU AT Command Reference"

"Iridium SBD IP Socket White Paper"

For more information, please visit www.beamcommunications.com

Configuration Settings

The RST425 allows the DTE to configure the data port communication parameters. The three configuration types are active, factory default, and stored. The active configuration is the set of parameters currently in use. They can be changed by the DTE individually via specific AT commands. The factory default configuration is stored in permanent memory. This configuration can be recalled at any time through use of the AT&Fn command.
Two groups of settings, or "profiles" can be stored as user-defined configurations. The DTE first creates desired active configurations and then writes them to memory using the AT&Wn command. These profiles can be designated to be loaded as the active configuration upon RST425 power-up through use of the AT&Yn command. The RST425 can be reset without loss of power to these profiles through use of the ATZn command. These profiles can be designated to be loaded as the active configuration upon RST425 power-up through use of the AT&Yn command. The RST425 can be reset without loss of power to these profiles through use of the ATZn command.
The configuration settings are stored in "S-register" locations.

Modes of Operation

The serial interface is always in one of three modes: command mode, SBD data mode or SBD session mode. When the data port is in command mode, AT commands can be entered to control the RST425. In command mode, flow control has no effect, with the RTS input ignored and the CTS output driven ON (low). When in SBD data mode, the RST425 is transferring binary or text SBD message data to or from the DTE.

In SBD data mode:

- All characters from the DTE not forming part of the message data are ignored (i.e. no AT commands may be entered).
- No unsolicited result codes are issued.
- RTS/CTS flow control, if enabled, is active. When RTS is OFF (high), the RST425 suspends transfer of data to the DTE; when CTS is OFF (high), the RST425 expects the DTE to suspend transfer of data to the RST425.

When in SBD session mode, the RST425 is attempting to conduct an SBD session with the network.
In SBD session mode:

- The DTE must wait for the +SBDI session result code.
- All characters from the DTE are ignored.
- Unsolicited result codes are issued where those codes have been enabled.

Transitions between the modes of operation are performed automatically by the RST425 in response to the SBD AT Commands; the DTE has no other control over the mode.

Serial port signal levels

Data Port Inputs

The inputs on the RST425 serial port (RTS, DTR and TXD) will operate correctly at TTL signal levels (logic low 0.4 V max, logic high 2.4V min) or RS-232 levels up to +/- 25 Volts. Because the circuit for the data port is an RS-232 receiver the lowest logic low and highest logic high are rated to +/- 25 Volts. The transition voltage point (transition from a Low to a High is at about 1V (Above 1V = a high; below 1V = Low).
RS-232 transmitters and receivers always invert. Thus if you use these inputs at logic level you would need to invert these signals using logic-level inverters.

Data Port Outputs

The five outputs from the RST425 serial port (DCD, DSR, CTS, RI and RXD) are all at RS-232 levels of approximately +/- 7 Volts no load (manufacturing test limits are 6 to 8 Volts). With a 3 kOhm load the output is +/- 6.4 Volts.

Hardware Failure Reporting

If the RST425 detects a hardware problem during initialization, the RST425 may be unable to function correctly. The RST425 notifies the DTE of this situation by issuing an unsolicited result code at the end of initialization:
HARDWARE FAILURE: <subsys>,<error>
where `<subsys>` identifies the software subsystem that detected the error, and `<error>` is the subsystem-specific error code.
Any AT commands that cannot be handled in the failure condition will terminate with result code 4 (“`ERROR`”).

RF Interface

This section describes the physical connector and RF specifications of the RF Interface.

Antenna Connector

The RST425 will have the following antenna connector characteristics:

Impedance -	50 Ohms nominal
Gain -	3dBi
Polarization -	RHCP
VSWR (maximum operational) -	1.5 : 1

Note: Existing qualified Iridium antennas may be used. (i.e. antennas designed for the 9522 and 9522A)

Antenna Connector Type

The antenna connector on the RST425 is a female SMA type. An SMA to TNC adapter is also provided, and can be utilized to suit the type antenna cable connector used.

Radio Characteristics

The tables within this section contain radio characteristics of the RST425 SBD Transceiver.

Average Power during a transmit slot (max):	1.6 W
Receiver sensitivity:	-118dBm
Max Cable loss permitted (Note 1):	2dB
Link Margin –Downlink (Note 2):	13dB
Link Margin –Uplink (Note 2):	7dB

NOTE 1:

Cable losses should be minimized. **Note that the total implementation loss for an antenna, connectors, cable, lightening arrestor and any other RF component between the transceiver and the antenna shall not exceed 3dB. Implementation loss higher than this will affect link performance and quality of service. Solutions with a loss higher than 3dB will not meet the requirements of Iridium Solution Certification.**

NOTE 2:

Link Margin given for free space.

Troubleshooting the RST

This chapter provides information to help you troubleshoot problems you may encounter while running the RST425.

Q	No power on RST425 (LED is off)
A	Check power is connected and correct DC voltage is available

Q	RST425 fails to find Iridium service (LED is Orange)
A	Check power connection Check Antenna connection and location

Q	PC cannot connect to RST425
A	Check that the correct cable is used on the correct port, and that the bit rate is set the same for both PC and RST425

Beam Warranty Conditions

Beam Communications gives this express warranty (along with extended warranty endorsements, where applicable) in lieu of all other warranties, express or implied, including (without limitation), warranties of merchantability and fitness for a particular purpose. This constitutes our sole warranty and obligation with regard to our products as well as the Customer's sole remedy.

Beam Communications expressly disclaims all liability and responsibility for any special, indirect or consequential damages or any further loss of any kind whatsoever resulting from the use of our product(s). The Customer's sole and exclusive remedy and the limit of Beam's liability for any loss whatsoever, shall not exceed the purchase price paid by the Customer for the product to which a claim is made.

All products manufactured by Beam Communications are warranted to be free from defects in material and workmanship in accordance with and subject to the following terms and conditions:

1. This warranty is limited to the original Customer only. It cannot be transferred or assigned to third parties unless the intent to transfer to a third party is expressly indicated in a purchase order and/or warranty-processing arrangements have been agreed upon in writing by Beam.
2. Beam Communications does not warrant any installation, maintenance or service of the Products not performed by Beam, nor does it warrant the use of Products with unapproved ancillary products.
3. Beam Communications will correct any defects in material or workmanship of products manufactured by Beam which appear within (12) months, from the date of shipment by Beam Communications to the Customer. Beam Communications will repair or replace, at our option, any defective product, provided that our analysis and/or inspection discloses that such defects developed under normal and proper use.
4. This warranty does not extend to goods subjected to liquid or particulate ingress, extreme humidity, misuse, neglect, accident or improper installation, or to maintenance or repair of products that have been altered or repaired by anyone except Beam Communications unless otherwise stated in writing.
5. The warranty is a return-to-base warranty and freight is paid by the sender.
6. A charge of USD150 including return freight will be made for testing returned product which is not defective or is found to be defective as the result of improper use, maintenance or neglect.
7. Beam Communications will not accept responsibility for any invoiced goods or services that are not covered by a Beam Communications written purchase order. Under no circumstances does Beam Communications agree to pay for labour or other related expenses associated with the troubleshooting and/or repair of our product without prior specific written authorization.
8. Information in our descriptive literature is based on product specifications that are current at the time of publication. Product specifications, designs and descriptive literature are subject to change as improvements are introduced. Although we announce changes as they occur, we cannot guarantee notification to every Customer. Beam Communications warrants delivered product to conform to the most current specifications, designs and descriptive literature.
9. This warranty policy may be expanded or limited, for particular categories of products or Customers, by information sheets published as deemed appropriate by Beam Communications. In particular, the warranty for third party Products is that of the third party and not Beams warranty.

USER / INSTALLER INFORMATION

Please record your serial number here for future reference:

Model: BEAM SBD Modem RST425

Serial no.: ☐☐☐☐☐☐☐☐

This number can be copied from the white shipping label on the RST425 box
Eg. RTK02833

Installation Location:	Installation Date:
Installation Technician:	Place Of Purchase: